

VACUUM REALLY DOES SUCK

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What Happened Here?



What Happened Here?

External pressure > Internal Pressure

This Sucks!

Common Causes of Vacuum

- Pumping out of an unvented vessel or accidentally draining an unvented vessel

Common Causes of Vacuum

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Note that vessel vents can become obstructed!

Common Causes of Vacuum

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Common Causes of Vacuum

- Pumping out of an unvented vessel or accidentally draining an unvented vessel
- Overfilling a vessel without a siphon breaker ... really?

Tank Overfilling

Question:

A brewer is pumping beer into a tank and beer begins flowing out of the overflow line. What is the brewer likely to do in response to this?



Tank Overfilling

And The Survey Says ...

- 1. Shut the inlet valve**

Tank Overfilling

And The Survey Says ...

- 1. Shut the inlet valve**
- 2. Turn off the supply pump**

Tank Overfilling

And The Survey Says ...

- 1. Shut the inlet valve**
- 2. Turn off the supply pump**
- 3. Shut the outlet/overflow valve**

Tank Overfilling

And The Survey Says ...

- 1. Shut the inlet valve**
- 2. Turn off the supply pump**
- 3. Shut the outlet/overflow valve**
- 4. Close all valves and turn off supply pump**

Tank Overfilling

And The Survey Says ...

- 1. Shut the inlet valve**
- 2. Turn off the supply pump**
- 3. Shut the outlet/overflow valve**
- 4. Close all valves and turn off supply pump**
- 5. Grab a pitcher to prevent beer loss!**



**DO NOT
DISTURB**

BLOOD ALCOHOL EXPERIMENT IN PROGRESS

Tank Overfilling

This is what happens if you simply stop liquid supply...



Tank Overfilling

This is what happens if you simply stop liquid supply...



Tank Overfilling

This is what happens if you simply stop liquid supply...



Tank Overfilling

This is what happens if you simply stop liquid supply...



The Not So Obvious Can Be A Real Surprise!



Common Causes of Vacuum

- Pumping out of an unvented vessel or accidentally draining an unvented vessel
- Overfilling a vessel without a siphon breaker ... really?
- **Hot CIP followed by cold rinse**

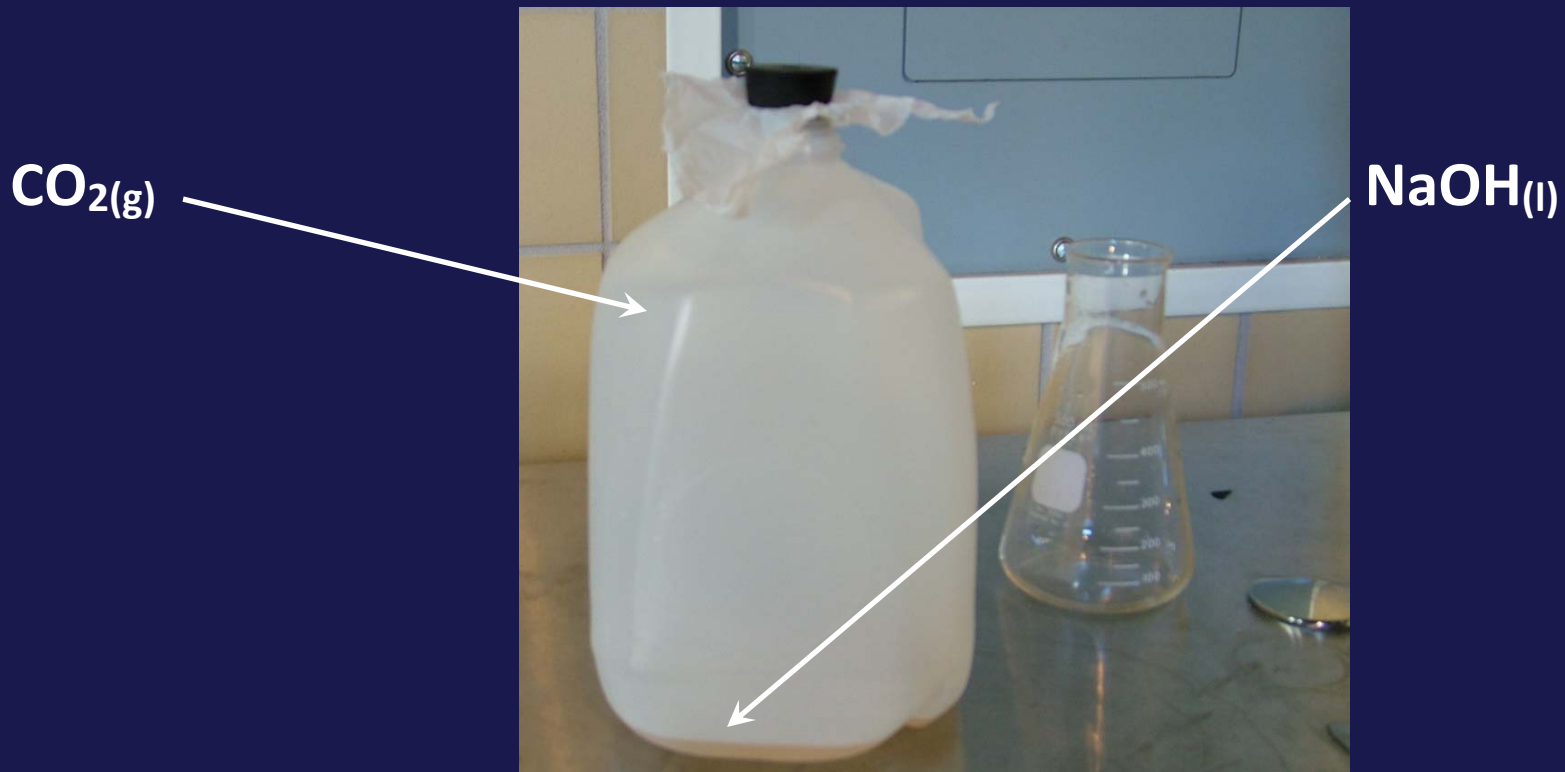
When Hot Meets Cold



Common Causes of Vacuum

- Pumping out of an unvented vessel or accidentally draining an unvented vessel
- Overfilling a vessel without a siphon breaker ... really?
- Hot CIP followed by cold rinse
- Spraying caustic into a CO₂ atmosphere

Caustic & Carbon Dioxide



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Real-World Examples



Real-World Examples



Real-World Examples



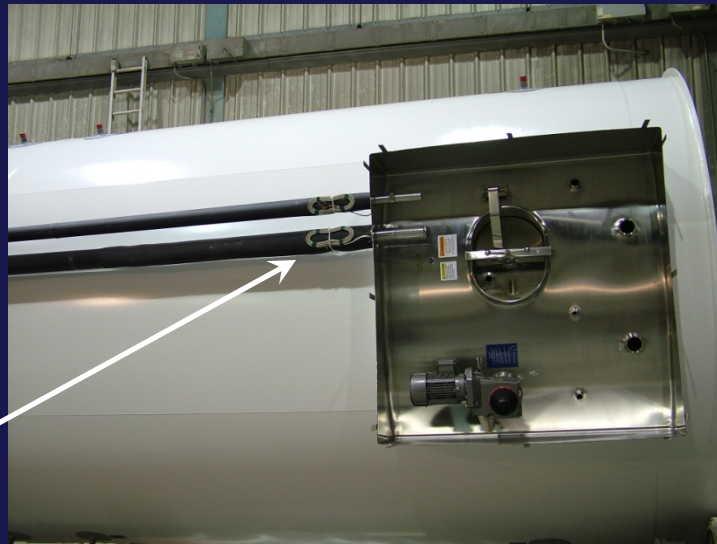
WORLD

Preventing Vacuum-Related Failure

1. **Installation of properly sized vacuum relief valves. Attention must be paid to the worst-case scenario when selecting relief valves and all possibilities need to be considered.**
 - ❖ **Free-draining is often considered to be the worst case for sizing purposes**
 - ❖ **Hot cleaning followed by ambient/cold rinse typically is more extreme than free-draining**
 - ❖ **KNOW YOUR PROCESS!**

Preventing Vacuum-Related Failure

1. Installation of properly sized vacuum relief valves. Attention must be paid to the worst-case scenario when selecting relief valves and all possibilities need to be considered.
2. Maintaining and inspecting vacuum relief valves, vents and overflows.



Heat tracing on milk
silo vent lines

Preventing Vacuum-Related Failure

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3. **Proper training to correctly respond to atypical events, such as tank over-filling.**

Preventing Vacuum-Related Failure

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2. **Maintaining and inspecting vacuum relief valves, vents and overflows.**
3. **Proper training to correctly respond to atypical events, such as tank over-filling.**
4. **Implementation of procedures consistent with process.**

Conclusions

- Vacuum failures do indeed occur in breweries
- The causes of these failures are well understood and preventable
- Review your process, and incorporate procedures and devices to address vacuum



Thank you for your attention and for the opportunity to participate in this meeting.